MODELLING THE CONTRIBUTION OF KNOWLEDGE MANAGEMENT TOWARDS ACHIEVING ORGANISATIONAL BUSINESS OBJECTIVES

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ABSTRACT : Knowledge management (KM) continues to receive mounting interest within the construction industry due to its potential to offer solutions for organisations seeking competitive advantage. This paper presents a KM input-process-output conceptual model comprising unique and well-defined theoretical constructs representing KM practices and their internal and external determinants in the context of construction. The paper also presents the underlying principles used in operationally defining each construct using extant KM literature, and offers a number of testable hypotheses that capture the inter-relationships between the identified constructs.

Key words : Knowledge Management, Business Environment, Organisational Culture, Business Objectives

1. INTRODUCTION

Knowledge is defined as a justified belief that increases an entity's capacity for effective actions [1], and can be viewed as a valuable strategic asset in a form of organisational capability with potential for influencing future actions [2,3]. Knowledge management (KM) focuses on knowledge-related activities to facilitate knowledge creation, capture, transformation and use, with the ultimate aim of leveraging organisations' intellectual capital to achieve desired organisational objectives. KM continues to receive mounting interest within the construction industry due to its potential to offer solutions for organisations seeking competitive advantage. Effective KM implementation, however, requires empirical understanding of the main business environmental challenges associated with the implementation, the interactions of KM activities and their contribution towards achieving business objectives. Despite recently published exploratory studies, the number of empirical studies into knowledge management in the construction industry is limited. A lack of a systematic way of assessing KM initiatives' contribution towards achieving organisational business objectives is evident [4,5]. Based on the literature review, this paper presents a conceptual model that would empirically investigate the above issues within the single business firm environment of construction organisations.

2. CONCEPTUAL MODEL PROPOSITION

The KM process can be modeled into the traditional input-process-output relationships. Similar to any business process, KM activities receive input from the external and internal business environment and produce applied knowledge output. The validity of this knowledge output should be judged according to the desired performance.

As presented in Figure 1, the hypotheses proposed by this model are primarily concerned with three (3) classical components of such a typical business process, i.e.,

- Contextual factors – the environmental input of a business operational system;
- KM activities – the business process; and
- Performance measures – the output of business process.

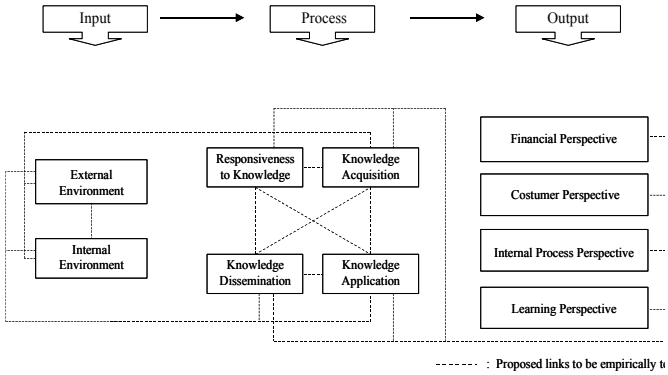

Figure 1 Input-Process-Output' model

There are ten (10) constructs in the above model. These constructs are conceptually and operationally defined in the following sections.

2.1 External Environment

'External environment' is defined as economic, technical and social agents of changes, which cover four (4) dimensions, i.e., economic swings, new market opportunities, impact of competition and technology [6]. The measurable elements under each dimension are adopted from the measurement scales developed by Badri et al. [7] and Droge et al. [8] in their empirical studies. These elements are selected as measurement variables to statistically develop a

summated scale to measure this construct.

Ward et al. [9] argue that munificence and dynamism are the two (2) major orthogonal environmental factors that affect strategies of business organisations. *Environment munificence* is the extent to which an environment supports growth of organisations within it; while *environment dynamism* refers to unpredictable change in environmental conditions faced by firms. Empirical studies based on the manufacturing industry [7,9] have supported that the environment and operations strategy are related. The scale developed by Badri et al. [7] are adopted herein as variables to measure the dimensions of economic swings and impact of competitors.

On researching the relationships between context, applied knowledge and performance within the manufacturing industry, Droge et al. [8] introduced contextual variables reflecting the external environment, i.e., 'technological turbulence' and 'demand unpredictability'. 'Technological turbulence' refers to the rate of product and process change within the industrial environment. 'Demand unpredictability' indicates a dimension of environmental uncertainty referring to the predictability of demand. Their analysis supports that 'technological turbulence' is positively related to new knowledge creation, and to applied knowledge; whilst 'demand unpredictability' inversely predicts applied knowledge. The scales developed by Droge et al. [8] for 'demand unpredictability' and 'technological turbulence' are adopted in our model to measure the dimensions of new market opportunities and impact technology, respectively.

2.2 Internal Environment

The construct of 'internal environment' has two (2) major dimensions, i.e., organisational and technical environment [10]. Organisational environment covers organisational culture (value and principles) and organisational climate (rules, policies, procedures, structure, incentive system, etc.) [8,10]. Technical environment refers to technological infrastructure and its ability to respond to technical change. The factors developed by Moffett el al.'s [10] for the construct of 'organisational climate' provide suitable dimensions for measuring the 'internal organisational environment'. Moffett el al.'s [10] scale for the construct of 'technical climate' provides dimensions to characterise the concept of 'internal technical environment'.

2.3 Knowledge Management Activities

It is suggested that KM activities can be strategically classified into four (4) key constructs: i.e., responsiveness to knowledge within the business environment; knowledge acquisition; knowledge dissemination; and knowledge application [11]. They are defined as follows:

- *'Responsiveness to knowledge'*: knowledge activities to respond to the various types of knowledge an organization has access to, in external as well as internal environment [12].
- *'Knowledge acquisition'*: knowledge activities of seeking and acquiring knowledge from the external environment and creating new knowledge based on the existing knowledge within the organisation [12,13].
- *'Knowledge dissemination'*: creation and maintenance of structures, systems, and processes for sharing knowledge across levels of analysis, and for retaining knowledge within the organisation [11].
- *'Knowledge application'* are knowledge activities towards the utilisation of knowledge [13].

Gold et al. [13] perceive knowledge acquisition, conversion, application and protection are essential organisational capabilities or "preconditions" for effective KM. Darroch [12] developed measurement scales for the KM activities identified as responsiveness to the environment, knowledge acquisition and knowledge dissemination. McCann and Buckner's [11] exploratory study on the strategic KM framework also analysed items representing 'applying intellectual capital'. These recent studies provide the measurable elements for the four (4) KM activity constructs of the proposed model.

A pilot study based on a sample of 43 managerial and professional staff members of the contracting organisations in Hong Kong was undertaken during June to August 2004. The objective of this study was to test whether the KM practices in Darroch's [12] scales for 'responsiveness to knowledge', 'knowledge acquisition' and 'knowledge dissemination' are actually being implemented. The analysis based on survey data revealed some practices in Darroch's [12] scale are not being implemented at all [5]. Accordingly, activity items with very low implementation levels have not been included as measurable elements for the KM activity constructs.

2.4 Performance Measurement

If KM, as it claims, focuses on building the successful link between knowledge and performance [14] and aims to leverage intellectual assets of the organisation to meet defined organisational objectives [15], then it is logical to assume KM activities will help to produce valid organisational knowledge. Thus, KM solutions should be measured according to organisational objectives through investigating the effectiveness of KM activities in producing valid knowledge that contribute to the realisation of these objectives [16]. Given a performance measurement system is at the heart of the performance management process, and determines how successful organisations have been in attaining their objectives [17], a performance measurement framework is required to serve the purpose of measuring KM solutions. The Balanced Scorecard (BSC), which was developed to communicate and to assess strategic performance and to align corporate strategy with performance measures [18: 2], is adopted as the framework in this research for measuring the performance of KM activities. This decision is made based on the following three (3) major considerations:

1. The BSC is widely considered as a suitable measurement framework for KM programmes, since its development was based on the recognition of intangible assets as the critical performance drivers and with a strategic orientation to guide future value creation through linking the organisational strategy to the selected performance measures [16,19].
2. The BSC provides a value measurement framework using non-monetary criteria to value the usefulness and desirability of intellectual assets with knowledge as an essential component, and is concrete to address the key issues in respect of improving internal management i.e., improving management of intangible resource, creating resource-based strategies, monitoring effects from actions and translating business strategy into actions [20].
3. The context of this research is within the construction industry, where the BSC is adopted as one of the performance measurement frameworks and serves mainly a strategic management purpose [17].

Accordingly the performance constructs of the conceptual model are defined in four perspective of the BSC:

- *'Performance from a financial perspective'* measures economic consequences of actions already taken [18,21] based on knowledge application. This construct is defined with a single dimension and measured by the scale developed by Droge et al. [8].

- *'Performance from a customer perspective'* measures the organisation's performance within the target market segments [18,21]. This construct is perceived to have a single dimension, while Jashapara [22]'s and Nesan [23]'s performance measures in respect of customer perspective are adopted as measurable elements, which are also chosen as measurement variables for this construct.

- *'Performance from an internal business process perspective'* measures the extent of internal-business-process derived from explicit strategies to meet shareholder and target clients' expectation [18,21]. This construct is perceived as having two (2) dimensions to characterise the business processes at both corporate and project level. The items in Gold et al's [13]'s measurement scale provide performance elements for internal business process under the corporate level dimension. At the project level, 'cost', 'time' and 'quality', the three traditional indicators of performance, are used as measurement variables [17].

- *'Performance from a learning and growth perspective'*: measures the infrastructure the organisation builds to create long-term growth and improvement [18,21]. Organisational learning and growth come from three principal sources: people, information systems, and organisational procedures [18: 28]. These three factors constitute the infrastructure of an organisation, and require investment if the organisation is to achieve ambitious long-term financial growth objectives [18: 127]. Accordingly this construct is measured in three dimensions: employee capabilities; information systems capabilities; organisational alignment as suggested by Kaplan and Norton [18: 127,146]. The measurable elements under the three dimensions are drawn from Jashapara [22]'s scale, Nesan [23]'s measures as well as Kaplan and Norton's [18: 134-143] measures. These elements are also taken as the measurement variables for the construct.

3. HYPOTHESIS DEVELOPMENT

The hypothetical KM input-process-output relationships proposed in this model can be summarized in the following three dimensions.

3.1 Impact of Environment on KM Activities

Changes within the external environment tend to affect organisational culture and climate, which in turn impact upon KM-related factors such as technology, information flow and people [10]. Some factors within the external environment i.e., 'technological turbulence' and 'demand unpredictability' are associated with knowledge creation and application [8]. The conceptual models proposed by Diakoulakis et al. [24] and Egbu [25] suggest some internal environmental factors would affect KM activities. In order to identify the relationships between these contextual factors on the specific KM activities, the conceptual model proposes that: 1) external business environmental factors would affect internal business environmental factors, and 2) both external and internal environmental factors would affect the intensity of KM activities.

3.2 Inter-relationships among KM Activities

The inter-relationships among the different categories of KM activities are recognised [26] and conceptually proposed from a strategic perspective in different KM models [14,24]. Thus the conceptual model proposes that the different categories of KM activities are associated with each other so as to provide empirical evidence to support these relationships.

3.3 Contribution of KM Activities to Performance

The performance constructs in the conceptual model measure the business performance in the four perspectives of the BSC, i.e., financial, customers, internal business processes, learning and growth. The conceptual model proposes that the intensity of KM activities would contribute positively to the business performance across these dimensions. The empirical evidence supporting these hypothesis are outlined as follows.

Financial perspective: Droge et al. [8]'s have found a positive relationship between applied knowledge and financial performance. Darroch [12] also identified a positive and significant correlation between all knowledge management scales (i.e., knowledge acquisition, knowledge

dissemination and responsiveness to knowledge) and comparative profitability. Brockman and Morgan [27]'s analysis supports that organisational efficiency in acquiring new information during new product development (NPD) is positively and significantly associated with new product performance, which is also measured by financial indicators. Recent empirical studies in the context of the construction industry also support that learning activities positively contribute to organisations' performance [22,23]. Financial indicators were also included in the performance measures in these studies.

Customer perspective: In Darroch [12]'s research, the scales for KM activities are positively and significantly correlated with two (2) customer-related comparative performance measures. Jashapara [22]'s analysis focusing on the UK construction organisations, supports that double loop learning has a positive impact on organisational performance employing four (4) performance measures in customer perspective. Nesan [23]'s case study (based on three (3) construction organisations) also proved that the strategic management performance aspects of 'market share' and 'new customer base' had improved after the implementation of the variables in the context of organisational learning and empowerment.

Internal business processes: Recent empirical studies have supported that KM activities are positively associated with various aspects of internal business processes, especially the innovation process. Gold et al. [13] consider that in addition to financial returns, the strategic contributions of KM capabilities to organisational effectiveness also include improved ability to innovate, improved co-ordination of efforts, rapid commercialisation of new products, and ability to anticipate and responde to changes within the business environment. In Darroch's [12] research the knowledge management scales are significantly correlated with all type of innovation. The recent empirical studies in the context of the construction industry also support that learning activities and providing efficacy information positively contribute to organisations' performance, including operational performance [22,23].

Learning and growth: Fedor's [28] empirical investigation into team environment supports that knowledge generation activities within the organisation are positively related to perceived project success in terms of accomplishment of project objectives and project outcomes; meanwhile, explicit knowledge dissemination is positively related to expected impact measured by perceived group learning. Given that construction works are carried out within a project-based environment, these findings are relevant to this research. Based on a survey of large commercial contractors within the NSW construction industry in Australia, Murray's [29] study identified that three of the four learning capabilities had significant influence on short-term project performance at different levels of learning. Janz and Prasarnphanich [30]'s structural equation modelling supports that the level of co-operative learning in the form of positive inter-dependence, promotive interaction, and group process demonstrated in teams has a positive impact on members' work satisfaction and team's work performance.

4. RESEARCH METHODOLOGY

The overall research design of this research project employs a quantitative approach that begins with establishing abstract, logical relationships among the concepts such as knowledge management activities and organisational performance; and then moves towards confirming the relationships via empirical analysis. Complementary to this approach a qualitative approach is considered to be used to provide more insights into the relationships.

A cross-sectional design is to be used in this research to get a 'snap-shot' of the 'contextual input – KM process – performance output' scenario of construction organisations. Data will be collected through a mail questionnaire survey based on a theoretical population of large and medium sized contractors operating in Hong Kong. The population is chosen based on the referential evidence that comparing to small contractors these organisations have more resources to implement knowledge management, whilst they also confront much more difficulties in the KM application than the other construction organisations such as consulting firms [31]; meanwhile contractors work with the project-based organisational structure which represent the typical nature of construction operations [32]. Qualitative data will be collected through one-on-one semi-structured interviews with the managers of the selected contractors.

During the process of data analysis, the technique of factor analysis will be used to develop the summated scales for the constructs. The reliability and validity of the scales will also be assessed. Hypothesis testing through correlation and regression analysis will be employed as primary investigation approaches in order to gain enhanced understanding of the relationships between the contextual factors, KM activities and performance measures.

5. CONCLUSION

This paper summarizes and presents the work of the first phase of a research project that aims at developing a performance measurement framework for analysing and measuring knowledge management (KM) contribution in the construction industry. In this phase, the KM process is explicitly modelled via a number of clearly articulated phases that ultimately lead to knowledge utilisation and capitalisation, which, in turn, adds value, or otherwise to meeting defined business objectives. The constructs of the model are conceptually and operationally defined. It is expected that the findings of the empirical study in the next phase can reduce the impact of subjectivity in assessing the contribution made by KM practices and initiatives toward achieving performance improvements.

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